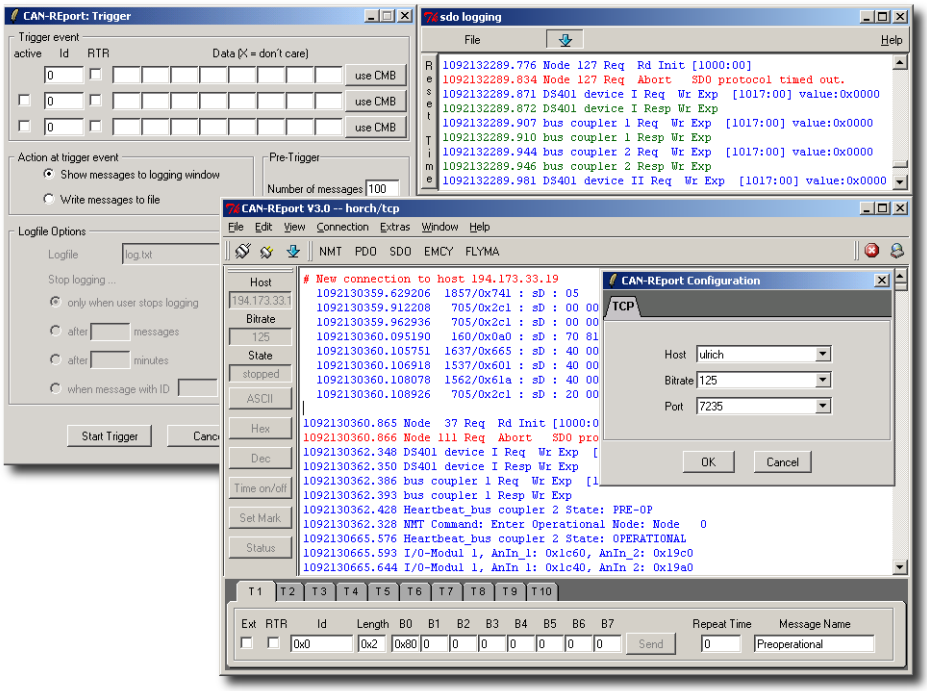
CAN-REport
User Manual


CAN-REport: Trigger
Trigger event
active Id RTR Data (X = don't care)
use CMB
Action at trigger event
Show messages to logging window
Write messages to file
Pre-Trigger
Number of messages 100
Logfile Options
Logfile log.txt
Stop logging ...
only when user stops logging
after messages
after minutes
when message with ID
Start Trigger
sdo logging
File Help
Reset Time
1092132289.776 Node 127 Req Rd Init [1000:00]
1092132289.834 Node 127 Req Abort SDO protocol timed out.
1092132289.871 DS401 device I Req Wr Exp [1017:00] value:0x0000
1092132289.872 DS401 device I Resp Wr Exp
1092132289.907 bus coupler 1 Req Wr Exp [1017:00] value:0x0000
1092132289.910 bus coupler 1 Resp Wr Exp
1092132289.944 bus coupler 2 Req Wr Exp [1017:00] value:0x0000
1092132289.946 bus coupler 2 Resp Wr Exp
1092132289.981 DS401 device II Req Wr Exp [1017:00] value:0x0000
CAN-REport V3.0 -- horch/tcp
File Edit View Connection Extras Window Help
NMT PDO SDO EMCY FLYMA
Host 194.173.33.1
Bitrate 125
State stopped
ASCII
Hex
Dec
Time on/off
Set Mark
Status
New connection to host 194.173.33.19
1092130359.629206 1857/0x741 : sD : 05
1092130359.912208 705/0x2c1 : sD : 00 00
1092130359.962936 705/0x2c1 : sD : 00 00
1092130360.095190 160/0x0a0 : sD : 70 81
1092130360.105751 1637/0x665 : sD : 40 00
1092130360.106918 1537/0x601 : sD : 40 00
1092130360.108078 1562/0x61a : sD : 40 00
1092130360.108926 705/0x2c1 : sD : 20 00
1092130360.865 Node 37 Req Rd Init [1000:0
1092130360.866 Node 111 Req Abort SDO pro
1092130362.348 DS401 device I Req Wr Exp [
1092130362.350 DS401 device I Resp Wr Exp
1092130362.386 bus coupler 1 Req Wr Exp [1
1092130362.393 bus coupler 1 Resp Wr Exp
1092130362.428 Heartbeat_bus coupler 2 State: PRE-OP
1092130362.328 NMT Command: Enter Operational Node: Node 0
1092130665.576 Heartbeat_bus coupler 2 State: OPERATIONAL
1092130665.593 I/O-Modul 1, AnIn_1: 0x1c60, AnIn_2: 0x19c0
1092130665.644 I/O-Modul 1, AnIn 1: 0x1c40, AnIn 2: 0x19a0
CAN-REport Configuration
TCP
Host ulrich
Bitrate 125
Port 7235
OK Cancel
T1 T2 T3 T4 T5 T6 T7 T8 T9 T10
Ext RTR Id Length B0 B1 B2 B3 B4 B5 B6 B7
0x0 0x2 0x80 0 0 0 0 0 0 0 0
Send
Repeat Time
Message Name
Preoperational

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1. Overview

The CAN-Analyzer *CAN-REport* from *port* is an efficient and versatile usable instrument for development, test and maintenance, for analysis and commissioning of CAN-based networks like DeviceNet and CANopen.

The built-in scripting capability allows a universal usage for development and test of CAN devices besides the normal possibilities of displaying the received CAN messages. It is especially useful in the field of industrial CAN networking.

The separation of hardware-interface (CAN access) and visualization software allows the usage in TCP/IP networks.

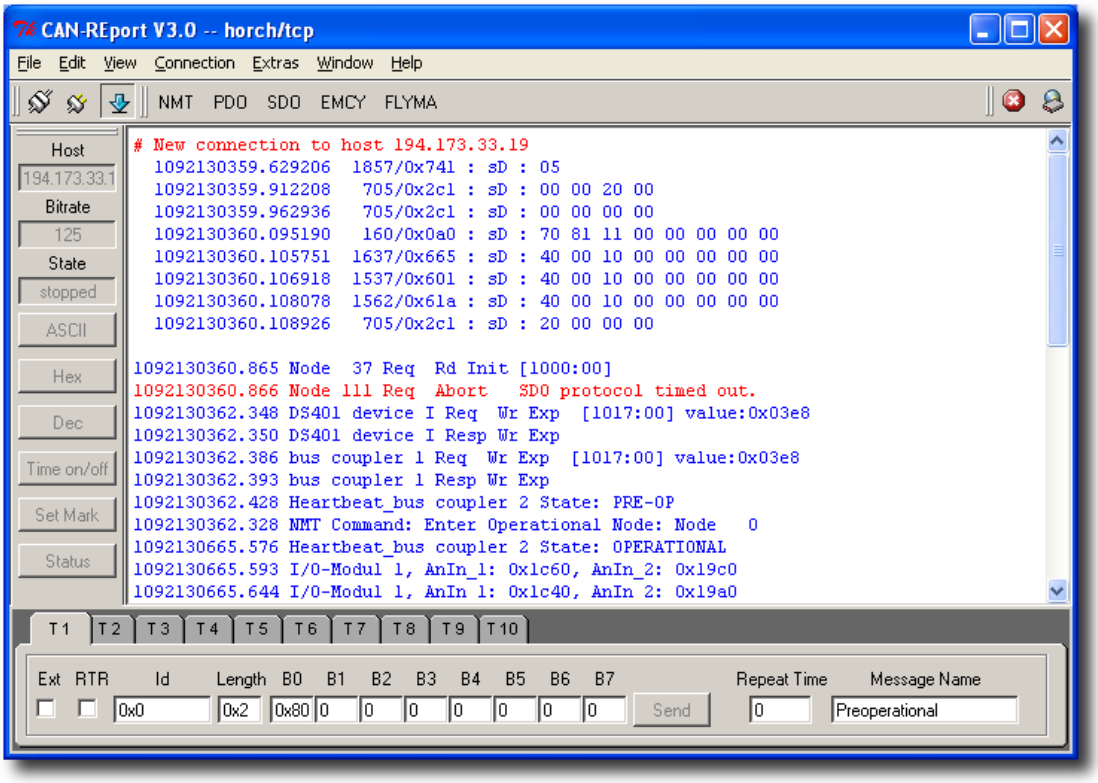


Figure 1, Analyzer view

2. Installation

The installation includes:

- the graphical user interface
- the horch server and
- a layer 2 driver for the CAN interface.

For the installation the following steps are necessary:

1. Maybe preparing installation steps are necessary depending on the used CAN-Interface. These steps are described in the file **INSTALL** in the horch directory on the installation CD.

   ! Please read this file before you start the installation.

2. Execute setup.exe.

   • Full Installation: The installation of all software components is happened automatically and menu driven. This includes copying of all manuals.

   • Customized Installation: The selection of software components is possible, which should be installed. For the installation of the *CAN-REport* the following components are necessary: *CAN-REport*, horch and layer 2 driver.

3. For the icon on the desktop set the options for the call of the horch server depending on your application. An overview of the options are given by the help:

   ```
   horch -h
   ```

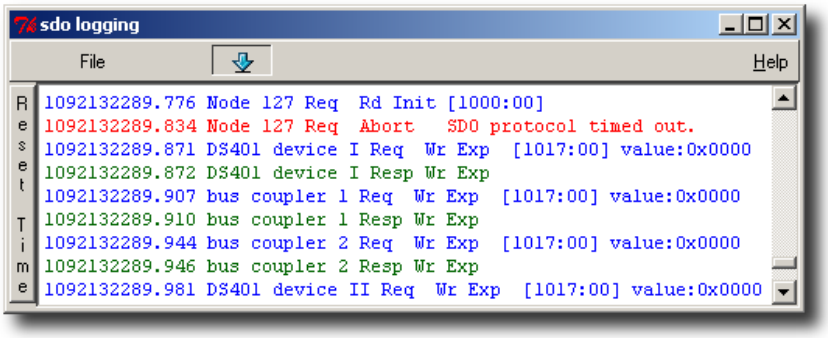
3. Application

In the standard equipment the CAN-Analyzer already has a lot of efficient basic functions at its disposal, which cover most application needs.

Among other things the on-line observation of the bus traffic, the transmitting of unique or cyclical CAN messages and whole message sequences as well as the recording of CAN messages and the storage to log files belong to this purpose. Besides the standard text format, we also support the CSV format for easy data transfer into spread sheet applications.

Application specific interpretation of the messages' data content can be defined through a project specific data base.

Through supplementary software modules extended functionality can be made available. These are among other things the protocol-specific representations in separate protocol windows for different higher layer protocol messages. Figure 2 shows this for SDO messages in CANopen-based networks.


sdo logging
File
Help
Reset Time
1092132289.776 Node 127 Req Rd Init [1000:00]
1092132289.834 Node 127 Req Abort SDO protocol timed out.
1092132289.871 DS401 device I Req Wr Exp [1017:00] value:0x0000
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1092132289.944 bus coupler 2 Req Wr Exp [1017:00] value:0x0000
1092132289.946 bus coupler 2 Resp Wr Exp
1092132289.981 DS401 device II Req Wr Exp [1017:00] value:0x0000

Figure 2, CANopen SDO interpretation and recording

You can see the symbolic representation of service and node name, "Req_Verriegelung", as well as displaying of "index:subindex" within the **SDO Initiate** requests.

With the help of the built-in scripting language programming of new functions or individual extensions with a graphic interface can be programmed easily.

4. Interfacing with CAN

4.1. TCP/IP

The analyzer *CAN-REport* consists of the CAN hardware interface and the visualization software. Both are connected as server and client by a standard TCP/IP network connection. This separation allows the usage of the CAN interface as a remote interface. That means both parts can be located at different computer systems. Remote monitoring of CAN networks is possible without additional or modified software over LAN, dial or internet connections.

The **Horch**-protocol is used as a communication protocol between operating-client and hardware-server on top of TCP/IP.

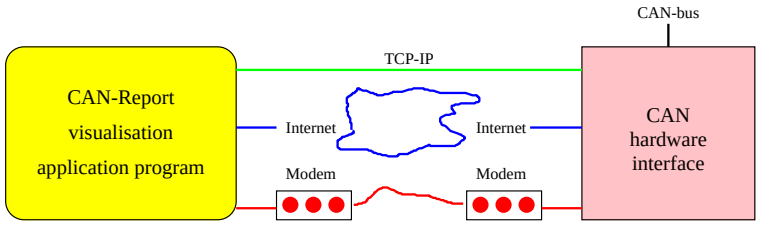


Figure 3, Client-Server communication

CAN interfaces are currently available for ISA, PCI, parallel port, serial, and PC104 with MS-Windows operating systems, ISA and PCI for LINUX or as Ethernet-interface as stand alone CAN-Server on the *port*-EtherCAN module.

4.1.1. CAN-Server

The CAN-Server *horch* is the interface from TCP/IP to CAN. A detailed description can be found in its manual.

4.1.2. Client - *CAN-REport*

The visualization and operating software is based on the scripting language *Tcl/Tk* which is available for many different computer platforms. The usage is therefore possible on all systems supporting this language. Through separation of hardware CAN-Interface and man-machine interface it is possible to use the *CAN-REport* besides MS-Windows on LINUX or Macintosh computers for controlling the CAN hardware interface.

4.2. Serial Interfaces

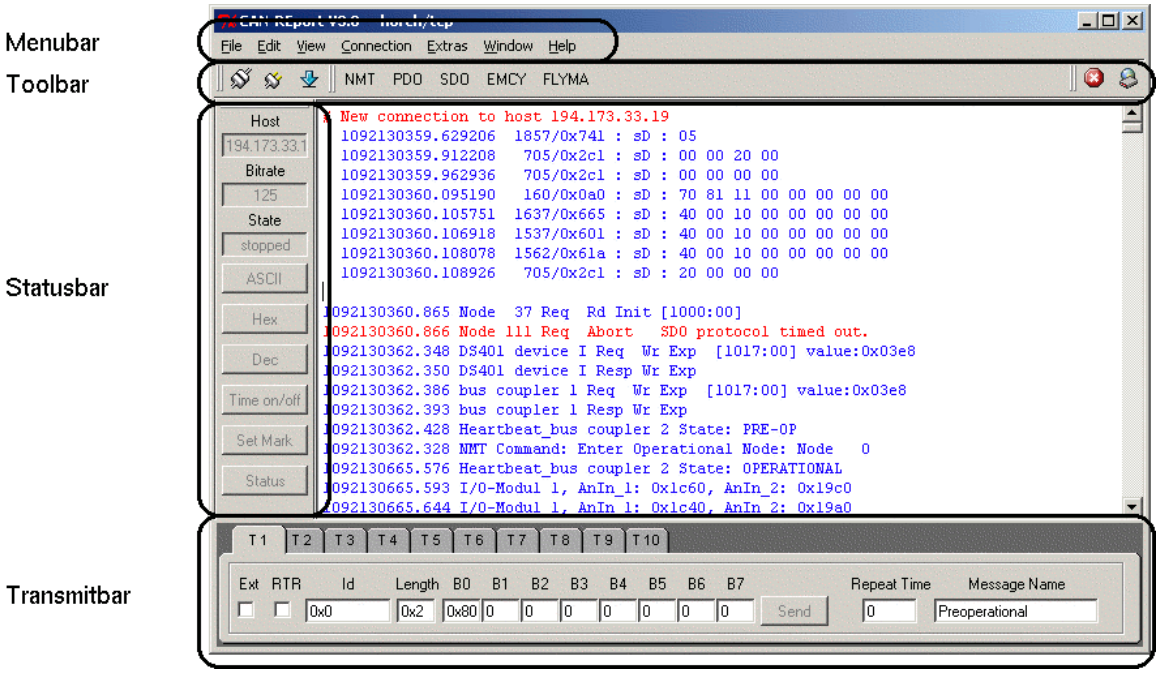
Besides the client-server connections the *CAN-REport* supports also direct connections to CAN-RS232 interfaces as:

- CAN232
- CANview

For further information about the configuration please have a look at the section Configuration of serial interfaces.

5. Graphical User Interface

The graphical user interface consists of 4 components.



5.1. Menubar

5.1.1. File Menu

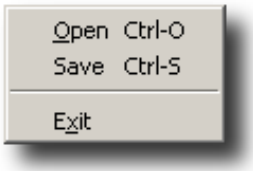


Figure 4, File Menu

Open

Open a previously stored logfile. If the *CANopen Extension* is activated then the contents can be interpreted as CANopen data.

Save

Save the contents of the main window into a file.

Exit

Exits *CAN-REport*.

5.1.2. Edit Menu

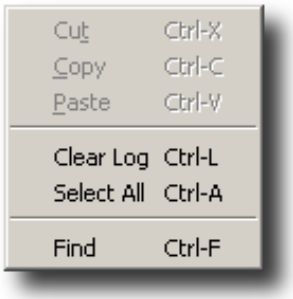


Figure 5, Edit Menu

Cut
: Cut selected text into clipboard.

Copy
: Copy selected text into clipboard.

Paste
: Pastes text from clipboard into the main window.

Clear Log
: Clears content of the main logging window.

Select All
: Selects the whole content of the main logging window.

Find
: Opens a standard find dialog box to search for text signatures.

5.1.3. View Menu

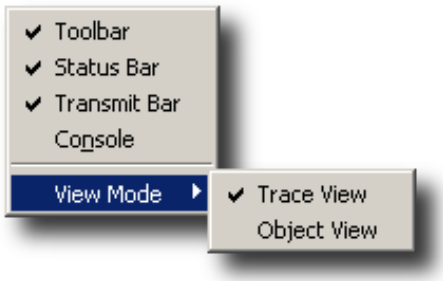


Figure 6, View Menu

Toolbar
: Toggles the view of the toolbar.

Statusbar
: Toggles the view of the statusbar.

Transmitbar
: Toggles the view of the statusbar.

Console
: Opens the Tcl-Tk console in the bottom of the main window. With the console you can extend the functionality of *CAN-REport* See paragraph Extending *CAN-REport*.

5.1.3.1. View mode

CAN-REport possesses a trace mode and a object view mode.

Trace view
: All CAN messages are written into the main window as they are received. The view shows: timestamp, CAN-ID, type, data.

Object view
: Each CAN message is placed in one line. Every time the message with the same CAN identifier is received the line is updated. A maximum of 192 messages can be displayed. The view shows: CAN-ID, type, data, period and a receive counter.

5.1.4. Connection Menu

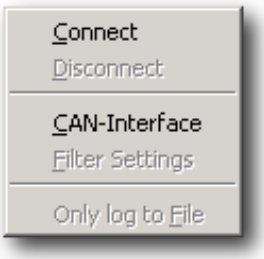


Figure 7, Connection Menu

Connect
: Connect to the CAN-Server *horch* All necessary data, i.e. server name, port and bitrate, are input within the menu *CAN-Interface*.

Disconnect
: Disconnect from the server.

CAN-Interface
: Opens a dialog for the configuration of the TCP/IP connection to the CAN-Server. Only the interfaces that are installed with a propriate driver are displayed.

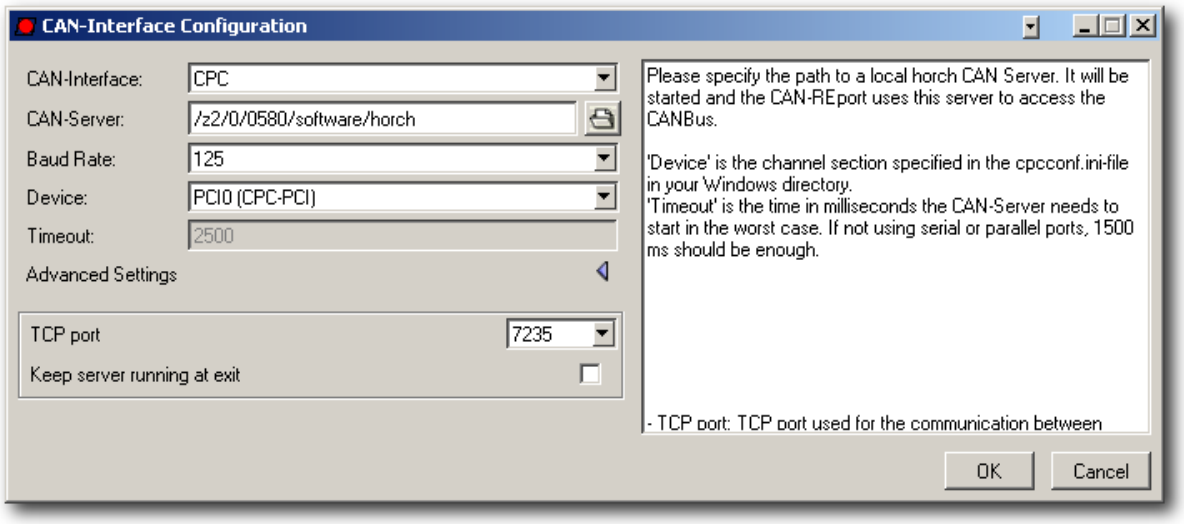

CAN-Interface Configuration
CAN-Interface:
CPC
CAN-Server:
/z2/0/0580/software/horch
Baud Rate:
125
Device:
PCI0 (CPC-PCI)
Timeout:
2500
Advanced Settings
TCP port
7235
Keep server running at exit
Please specify the path to a local horch CAN Server. It will be started and the CAN-REport uses this server to access the CANBus.
'Device' is the channel section specified in the cpcconf.ini-file in your Windows directory.
'Timeout' is the time in milliseconds the CAN-Server needs to start in the worst case. If not using serial or parallel ports, 1500 ms should be enough.
- TCP port: TCP port used for the communication between
OK
Cancel

Figure 8, Configuration dialog of CAN interface

Filter Settings

Opens a dialog for setting the acceptance mask register of the CAN controller. Although this menu is provided not every hardware interface supports the setting of registers. See paragraph Filter.

Only Log to File

CAN messages are saved to a logfile and are not displayed in the main window.

5.1.5. Extras Menu

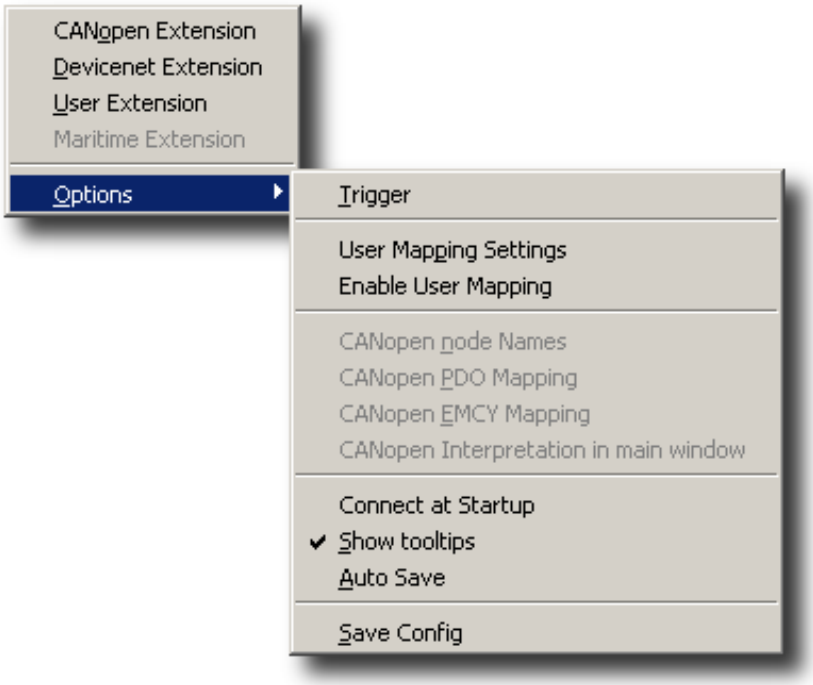


Figure 9, Extras Menu

CANopen Extension

Loads the CANopen extension. If switched on the toolbar is extended by buttons for the CANopen services SDO, PDO, NMT, EMCY, FLYMA. When clicking on a button a windows pops up and displays the CAN message of its service.

DeviceNet Extension

Loads the DeviceNet extension. If switched on the toolbar is extended with a button for the DeviceNet log window. When clicking on a button a window pops up and displays a descriptive text for the message.

User Extension

Loads the file <application.tcl> and adds a button to the toolbar. This file provides a Tcl-function for user-defined protocol interpretation. An example file is provided.

Maritime Extension

Loads the maritime Extension. It is used for monitoring 2 CAN lines at a time. Therefore it needs to connect to two CAN-servers. When the extension is activated it closes the current connection. The CAN-Interface dialog now provides input fields to connect to two CAN-servers. The main window displays the CAN messages from both lines. The transmitbar is changed in that the checkbuttons for extended messages and RTR messages now are used for selecting the line.

5.1.5.1. Options

Trigger
: Opens a window for trigger configuration (see paragraph Trigger).

User Mapping Settings
: Opens a window for configuration of CAN messages that are interpreted automatically by *CAN-REport*. See Interpretation of CAN messages.

Enable User Mapping
: Activates and deactivates the user mapping.

CANopen Node Names
: Opens a dialog in which you can assign names to node id's. When the *CANopen extension* is on then this name is displayed instead of the node id.

CANopen PDO Mapping
: Opens a dialog in which you can define how data of PDO messages is interpreted. The mapping specifies the COB-ID, symbolic name of the PDO and pairs of data type and symbolic name for the data. See Interpretation of CAN messages.

CANopen EMCY Mapping
: Opens a dialog in which you can define how data of EMCY messages is displayed. The mapping specifies the COB-ID, symbolic name of the EMCY and pairs of data type and symbolic name for the data. See Interpretation of CAN messages. See Interpretation of CAN messages.

CANopen interpretation in main window
: Activates CANopen interpretation in the main window.

Connect at Startup
: This option controls the startup behavior. When activated *CAN-REport* will try to connect to the CAN server at the next start.

Tooltips
: Activates tooltips for every button and input field.

Auto Save
: If this menu is activated then the configuration is stored before exiting *CAN-REport*.

5.1.6. Window Menu

Figure 10, Window Menu

Clear All
: Clear the content of the main window and of windows that are created of extensions.

Cascade
: Place the extension windows cascaded next to the main window.

Tile Vertical
: Place the extension windows vertical next to the main window.

Tile Horizontal
: Place the extension windows horizontal under the main window.

Hide All
: Hide all extension windows.

Show All
: Show all extension windows.

5.1.7. Help Menu

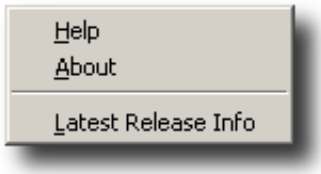


Figure 11, Help Menu

Help
: Provides a short help to *CAN-REport*.

About
: Copyright and license information. Additionally it displays the Tcl/Tk packages that are available.

Latest Release Info

Checks for the latest Release of *CAN-REport*. Therefore it establishes a TCP/IP connection to *http://www.port.de*

5.2. Toolbar

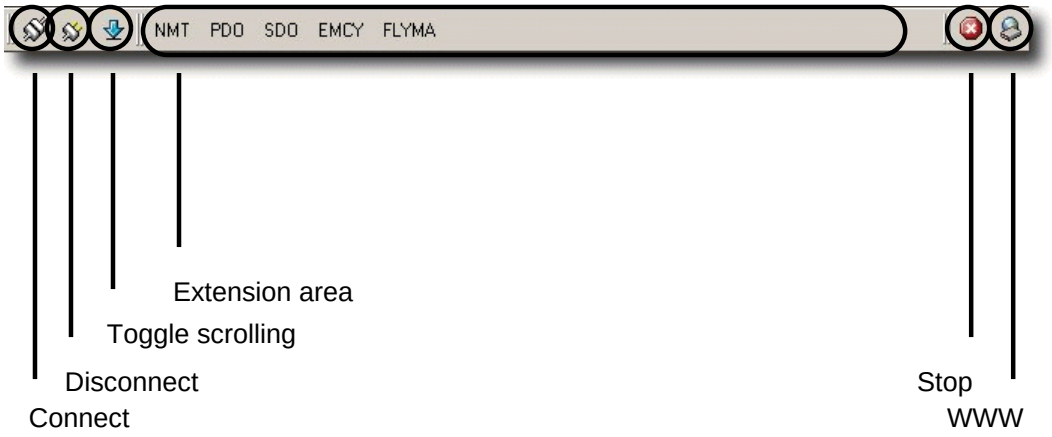


Figure 12, Toolbar

The toolbar provides quick access to the menu items Connect and Disconnect. The third button with the down arrow switches scrolling of the main window on or off. The stop button is used for canceling user-defined scripts. Please see paragraph: Extending *CAN-REport*. With the "www"-button *CAN-REport* checks if a new version of *CAN-REport* is available. Therefore it connects to the internet.

5.3. Statusbar

Figure 13, Statusbar

The Status shows information about the connection to the *horch*-Server. Additionally there are buttons influence the display of the CAN messages in the main window. The buttons "ASCII", "Hex" and "Dec" change the display of the data of a CAN message. With the "toggle Time"-button the display of the receiving time can be switched on and

off. It is displayed in "seconds.microseconds". The indication of microseconds depends on the driver. The linux driver *can4linux* supports a resolution of milliseconds. With the button "Set Mark" a separation line is inserted in the main window.
The status button provides a window with information about the underlying CAN hardware and driver respectively. The figure 14 below shows the information of a CAN server that is running on linux. Windows driver do not support all shown information. Therefore some values will always show 0.

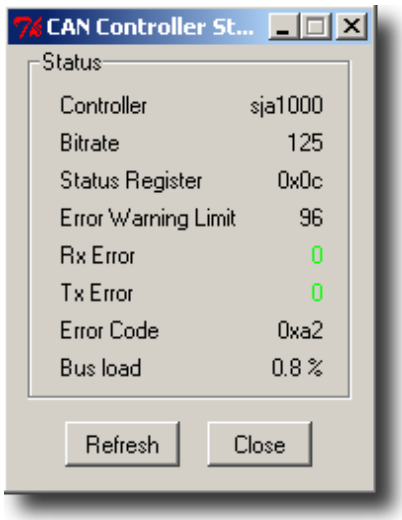


Figure 14, Status window

5.4. Transmit Toolbar

CAN-REport also allows it to send CAN messages. In the transmit toolbar at the bottom a complete CAN message can be specified with CAN id and CAN data With the button "Send" the message is sent. The number of tabs can be set in the configuration file <can-report.rc> with:

```
set ST(txch) 12 ; #put any number here
```

The CAN messages are stored in the configuration file in the current working directory. If "AutoSave" was activated *CAN-REport* will save the settings automatically at exit. At the next start all your settings will be reloaded. Optionally a name can be assigned to a CAN message. The edit fields take decimal, hexadecimal and octal values as input. Hexadecimal values are prepended with "0x" and octal values with "0". If it is necessary to send CAN messages periodically, then a "Repeat Time" in ms can be specified. The CAN message sent is not displayed in the main window. Only a notification is shown. If a "Repeat Time" was specified no notification is displayed.

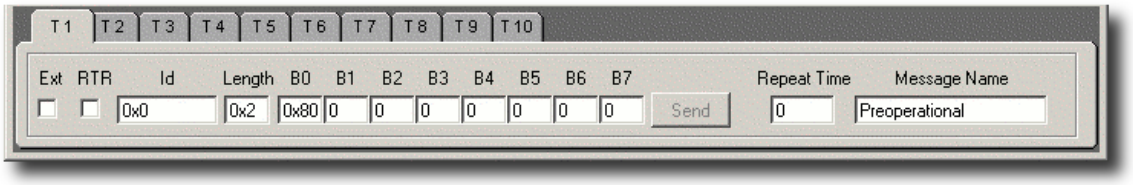


Figure 15, Transmit Toolbar

6. Interpretation of CAN messages

This dialog is used for User-, PDO and EMCY-Mapping. PDO and EMCY mapping is only available if the *CANopen Extension* is activated. PDO/EMCY-Mapping is used to interpret CAN-messages with ID of the PDO (0x181 - 0x57F) and EMCY (0x81 - 0xFF) range in a user specific way. The user mapping can be used for all other CAN messages.

The data contents can be interpreted as signed and unsigned integer values. Each data item can be assigned to a user specific text and the data format ("big endian", "little endian") can be selected. Configuration is done with two dialogs. First there is an overview dialog that shows all configured messages. Second there is the message configuration dialog.

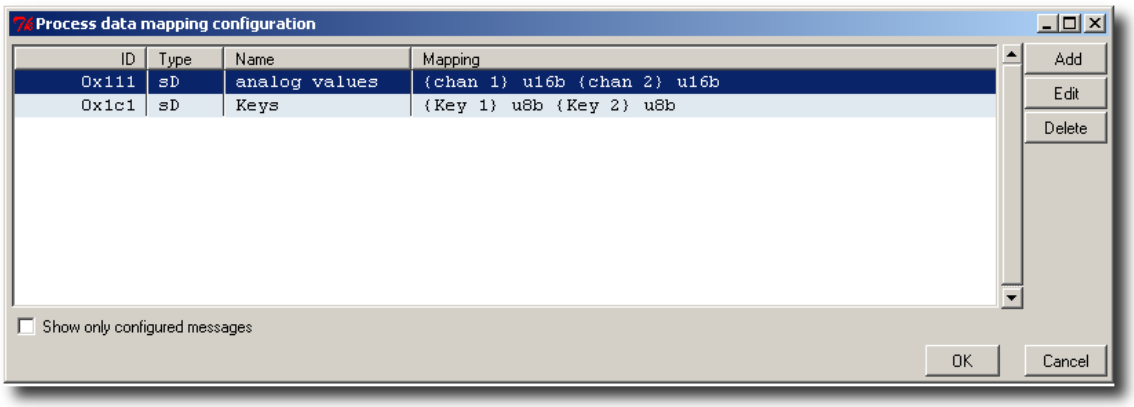


Figure 16, PDO/EMCY-Mapping dialog

The dialog has buttons to add, edit and delete messages that should be interpreted. On press of the add and edit button the message configuration dialog opens.

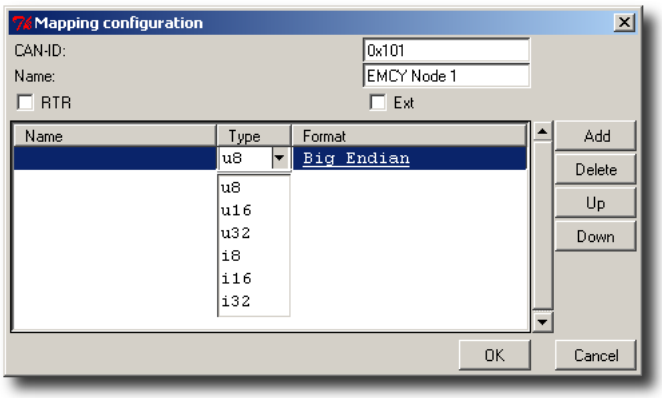


Figure 17, Message configuration dialog

Note: For EMCY messages the first 3 bytes of the CAN message are predefined as u16 and u8. This is not displayed and cannot be altered.

7. CANopen-Extension

7.1. Set Node Names

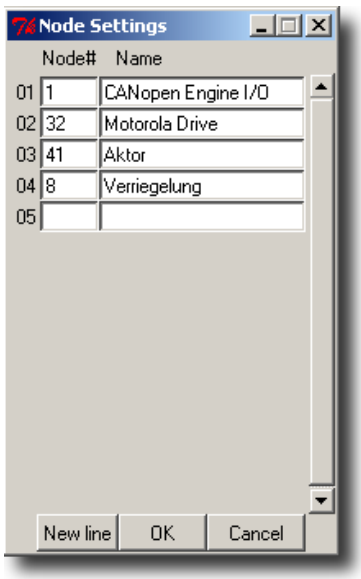


Figure 18, CANopen configuration of CANopen node names

This dialog is only available if *CANopen Extension* is activated. With this dialog you can define a symbolic name for a CANopen device. This name is used is all CANopen service windows instead of the node id. Figure 19 shows an example.

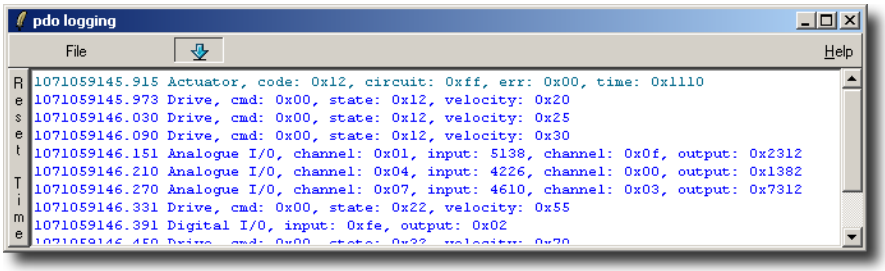

pdo logging
File
Help
Reset Time
1071059145.915 Actuator, code: 0x12, circuit: 0xff, err: 0x00, time: 0x1110
1071059145.973 Drive, cmd: 0x00, state: 0x12, velocity: 0x20
1071059146.030 Drive, cmd: 0x00, state: 0x12, velocity: 0x25
1071059146.090 Drive, cmd: 0x00, state: 0x12, velocity: 0x30
1071059146.151 Analogue I/O, channel: 0x01, input: 5138, channel: 0x0f, output: 0x2312
1071059146.210 Analogue I/O, channel: 0x04, input: 4226, channel: 0x00, output: 0x1382
1071059146.270 Analogue I/O, channel: 0x07, input: 4610, channel: 0x03, output: 0x7312
1071059146.331 Drive, cmd: 0x00, state: 0x22, velocity: 0x55
1071059146.391 Digital I/O, input: 0xfe, output: 0x02

Figure 19, CANopen PDO interpretation and recording

7.2. "Service oriented interpretation"

The CANopen extension provides separate logging windows for the services: NMT, SDO, PDO, EMCY and Flying Master (FLYMA).
The interpretation for PDO and EMCY can be tailored alike the user mapping for the specific application.

8. Trigger

With the trigger functionality *CAN-REport* is able to wait for certain CAN messages and continue recording after the desired message was received.

Trigger Event	-	Specifies the CAN message with its contents to wait for. With the help of the CANopen Message Builder it is easy to create CAN messages which conform to the CANopen protocol.
Action at trigger event	-	Select what to do when the specified CAN message was received. CAN messages can be displayed in the main window or save in a logfile.
Logfile options	-	Determine what else *CAN-REport* should do when writing to a logfile and specified the CAN messages were received.

Table 1, Sections of the trigger dialog

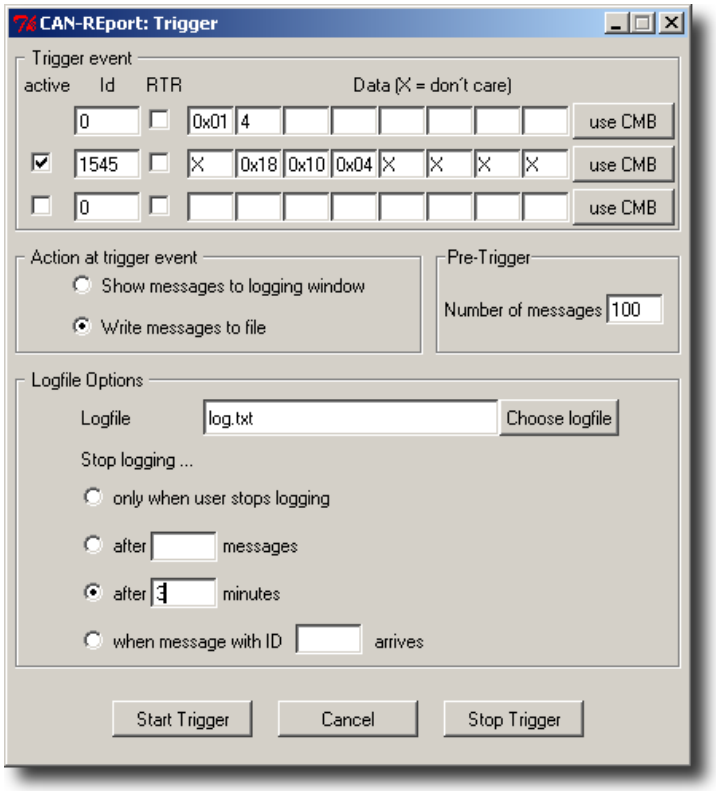


Figure 20, Trigger dialog

The process of triggering is started with the button "Start Trigger". During the trigger process the dialog stays on top of the application and recording of messages in the main window stops. After the specified CAN message was received the trigger dialog disappears.

8.1. Defining a trigger CAN message

Up to three different CAN message can be specified as trigger events. The second and third CAN message are activated through the checkbutton labeled "active". The first CAN message is active by default. The input in the fields CAN-ID and data can be specified as decimal, hexa-decimal or octal numbers. Hexa-decimal numbers are prepended with "0x" and octal numbers with "0". A blank input field determines the end of the CAN message. Any data byte after a blank input field is ignored. The length is then calculated by the number of non empty input fields. In order to ignore the contents of a byte mark it as don’t care by entering an "X" into an edit field instead of a numerical value. Then its value is not compared with the received message.

Examples:

Figure 21, Trigger example 1

CAN message with 8 bytes length. Byte 4 to 7 are marked as don’t care. Numbers used in decimal hexadecimal and octal

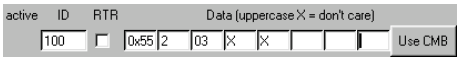


Figure 22, Trigger example 2

CAN message with 5 bytes length. Byte 4 and 5 are marked as don’t care. Numbers used in decimal hexadecimal and octal

Figure 23, Trigger example 3

Only the CAN-id is compared. The content and length of the CAN message is not evaluated.

8.2. Defining a trigger Remote Request CAN message

Defining a Remote Request CAN message follows the same rules as a "normal" CAN messages. Setting the expected length of the RTR message is done with the don’t care bytes. Example:

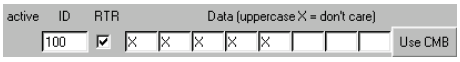


Figure 24, Trigger example 4

The *CAN-REport* triggers on a RTR message with CAN id 0x64 and a length of 5 bytes.

8.3. CANopen Message Builder

The CANopen Message Builder eases creating of CAN messages for the trigger which conform to the CANopen protocol. It provides input masks for the CANopen services NMT, PDO, SDO, HEARTBEAT and EMCY. Figure 25 shows the input mask for the NMT service. The CANopen Message Builder is only available with the CANopen Extension.

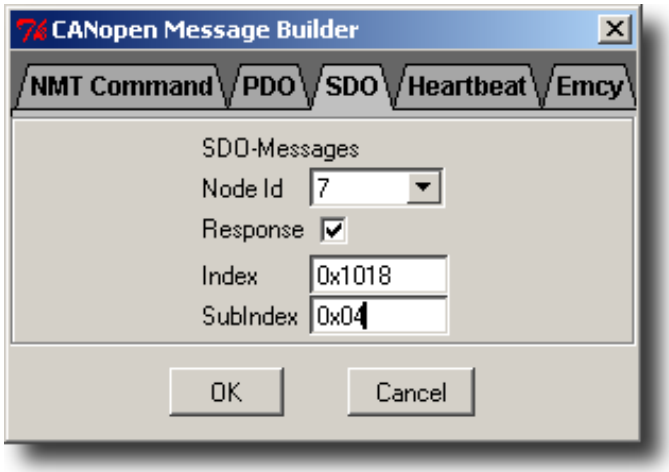


Figure 25, Input dialog for NMT service of the NMT service

9. Filter

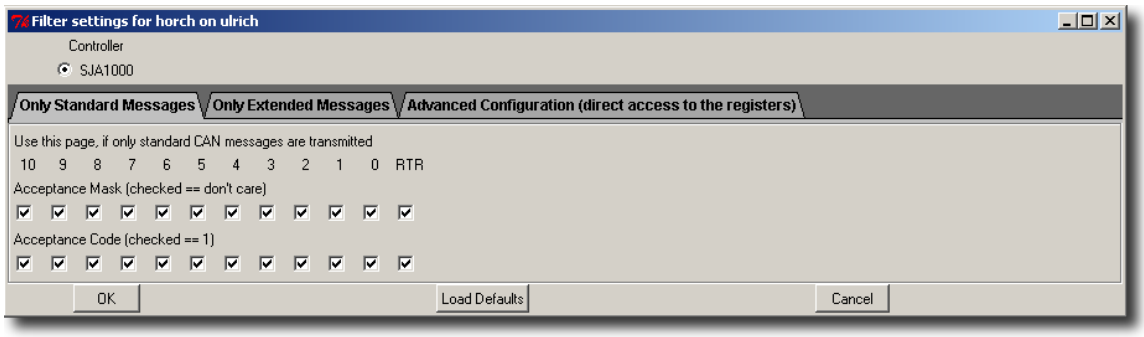

Filter settings for horch on ulrich
Controller
SJA1000
Only Standard Messages
Only Extended Messages
Advanced Configuration (direct access to the registers)
Use this page, if only standard CAN messages are transmitted
10 9 8 7 6 5 4 3 2 1 0 RTR
Acceptance Mask (checked == don't care)
Acceptance Code (checked == 1)
OK
Load Defaults
Cancel

Figure 26, Filter dialog

The filter dialog provides access to the register of the acceptance mask of the CAN controller SJA1000. The usage of acceptance filtering in the CAN-Controller reduces the interrupt load. There are three ways of defining the acceptance mask:

1. Input for the acceptance mask for CAN 2.0 A starting with the MSB on the left side.
2. Input of the acceptance mask for CAN 2.0 B starting with the MSB on the left side.
3. Input of the acceptance mask as it is defined in the register of the CAN controller.

This feature depends on the hardware and driver respectively you are using. At the moment the horch server for *can4linux* and *CPC (SJA1000)* support setting the acceptance mask registers. The other supported hardware interfaces (see Restrictions) don't support this.

Attention: Although it is possible to set the two least significant bits of the CAN identifier the SJA1000 doesn't use these two bit during acceptance filtering.

10. Programming with *CAN-REport*

10.1. Extending *CAN-REport*

With the help of the integrated console convenient commands for the interactive access on the CAN network are available and not only for device developers. These commands can be used in test scripts. Commands like **`wr`** for the sending of messages or **`wait`** for the synchronization with CAN messages on the network belong to this purpose.

Overview of user function

wait {id timeout}	- *wait for CAN message with id or until timeout*
wait2 {id type timeout}	- *wait for CAN message with id and type or until timeout*
wr {args}	- *send CAN message with standard identifier*
wrx {args}	- *send CAN message with extended identifier*

Detailed function description

wait {id timeout}

wait for CAN message with id or until timeout

this function is deprecated please use wait2

Arguments

id - can be an integer, or hex (0x...) or "any"
timeout - in ms, defaults to 10000 == 10s

Results

String with message
String: "wait timeout"

wait2 {id type timeout}

wait for CAN message with id and type or until timeout

Arguments

id - can be an integer, or hex (0x...) or "any"
type - any combination of s,x,D,R
s - standard; x extended
D - data; R - RTR
timeout - in ms, defaults to 10000 == 10s

Results

String with message
String: "wait timeout"

Example

```
    wait2 12 R   ; wait 12s for RTR ID of any format s
or x
    wait2 10 sR  ; wait 10s for standard RTR ID
    wait2 any    ; wait for the next message
```

wr {args}

send CAN message with standard identifier

Arguments

args - a CAN message. It is specified in the format
id [r] data-bytes

Results

nothing

Example

```
    wr 0x620 r 0x30 0xff
    wr 0x20    0x69 0x55
```

wrx {args}

send CAN message with extended identifier

Arguments

args - a CAN message. It is specified in the format
id [r] data-bytes

Results

nothing

Example

```
wrx 0x820 r 0x30 0xff
wrx 0x20    0x69 0x55
```

The following figure shows an example session at the **console** entering a command sequence:

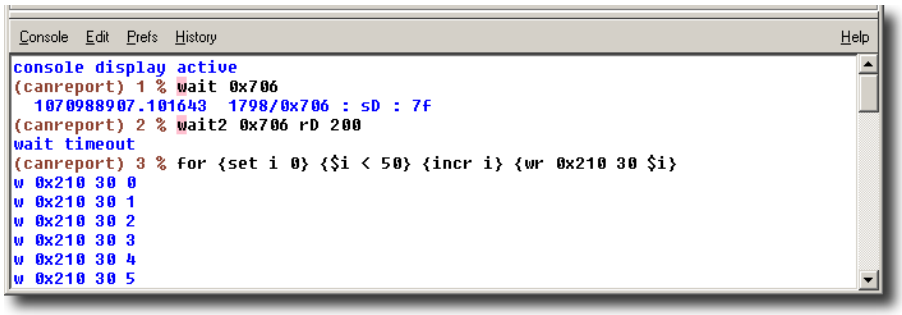

Console Edit Prefs History Help
console display active
(canreport) 1 % wait 0x706
1070988907.101643 1798/0x706 : sD : 7f
(canreport) 2 % wait2 0x706 rD 200
wait timeout
(canreport) 3 % for {set i 0} {$i < 50} {incr i} {wr 0x210 30 $i}
w 0x210 30 0
w 0x210 30 1
w 0x210 30 2
w 0x210 30 3
w 0x210 30 4
w 0x210 30 5

Figure 27, Entering interactive commands

The resulting messages at the CAN network are shown in the next figure:

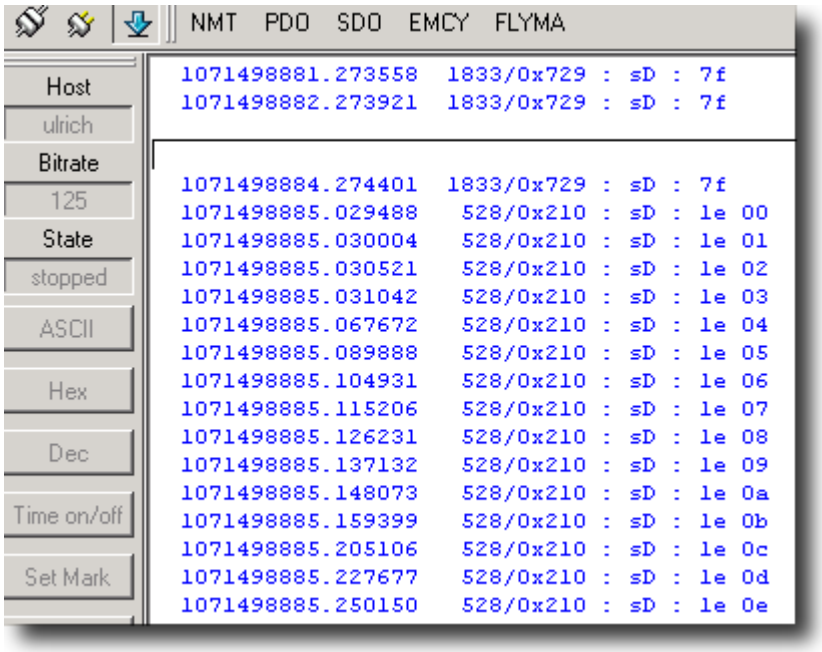


Figure 28, Results of the commands of figure 4

The commands can be combined into sequences or procedures. All semantics of modern high level languages are available.

Particularly for commissioning and error analysis a highly precise time resolution of the received CAN messages on the network is necessary. The time represented by *CAN-REport* is influenced in this case only from the used hardware. A time resolution up to µs can be achieved by using CAN interface boards under the LINUX operating system.

The available recording functions allow to store the results of an entire test run, but also the contents of logging windows, in separate files. As well it is possible to store the CAN messages directly in a file without displaying them on the screen. These files can be interpreted later by the CANopen or user defined extensions. This is especially practical at high bus load.

10.2. Interpretation of CAN messages

The *CAN-REport* features the interpretation of CAN-messages. For the application layer protocol CANopen this was already done. When the button "User extension" in the file menu is pressed a file called <application.tcl> is loaded and a button is placed on the tool-bar. This file has to be placed in the working directory. When the button in the toolbar is pressed a window pops up. The user can write an extension for the *CAN-REport* and display his own interpretation of the CAN messages in this window. The widget path to the user window is `.usr`. For writing your own CAN interpretation the template file

application.tcl is provided. It contains the procedure `application`. This procedure is called on each reception of a CAN message.

```
proc application { msg } {

}
```

This procedure takes the parameter `msg`. It contains the complete message with time-stamp, id, data type and the data. Each field is separated by spaces.

```
      11.123  256/0x100 : sD : 00 01 02 03 04 05 06 07
#     ^       ^           ^    ^
#       time  id dec/hex type data 1..8 (if available)
```

There are already functions for extracting the data.

Overview of user function

InsertText {win string tag chan}	*- Insert text <string> into user window*
get_can_id {msg}	*- extract CAN message identifier from message string*
get_data {msg}	*- return the data of a the message*
get_dlc {msg}	*- return the data length code of the message*
get_time {msg}	*- return time of message if time was set*
get_type {msg}	*- return the type of the message*
is_std {msg}	*- check if the message is a standard CAN message*

Detailed function description

InsertText {win string tag chan}

Insert text <string> into user window

Arguments

win - widget-path .usr
string - Text to insert into the text-widget
tag - tag, that defines the font
the tags stdout and stderr are already defined

Results

Inserts a text in the user window

Example

```
InsertText .usr "hello world!" stdout
InsertText .usr "$msg" stdout
```

get_can_id {msg}

extract CAN message identifier from message string

Arguments

msg the standard message string provided for the procedure application {}

Results

the CAN-Id as a decimal value

get_data {msg}

return the data of a the message

Arguments

msg the standard message string provided for the procedure application {}

Results

list containing the databyes of the CAN message
in case it is an RTR message an empty string is returned:

get_dlc {msg}

return the data length code of the message

Arguments

msg the standard message string provided for the procedure application {}

Results

an integer value between 0 and 8 for a valid msg
an empty string for an invalid msg

get_time {msg}

return time of message if time was set

Return time information if time was set.
When time wasn't set the an empty string is returned

Arguments

msg the standard message string provided for the procedure application {}

Results

time - when time is on
empty string - when time is off

get_type {msg}

return the type of the message

Arguments

msg the standard message string provided for the procedure application {}

Results

D- Data frame
R- Remote frame

is_std {msg}

check if the message is a standard CAN message

Arguments msg the standard message string provided for the procedure application {}

Results

1 if the message is a standard CAN-Message
0 if the message is a extended CAN-Message

10.2.1. Example

```
#The procedure application receives the message and interprets it.
#It’s an example for an user-defined interpretation of CAN-Messages.
#

proc application { msg } {

    set tag stdout
    set msg ""

    # get id
    set id [get_can_id $msg]
    if { $id eq "" } {
     return
    }

    if { $id == 0x201 } {
     # extract data
     set data [get_data $msg]

     set len [get_dlc $msg]
     for { set i 0 } { $i < $len } { incr i } {
         set byte$i [lindex $data $i]
     }
     if { $byte0 == 0x55 } {
         set msg "Start processing"
     }
    }

    if { $id == 0x281 } {
     # extract data
     set data [get_data $msg]

     set len [get_dlc $msg]
     for { set i 0 } { $i < $len } { incr i } {
         set byte$i [lindex $data $i]
     }
     if { $byte0 == 0x1F } {
         set msg "zero limit switch reached"
     }
    }
```

```
    InsertText .usr $msg $tag
    return
}
```

10.3. Extending the user interface

With the script language Tcl/Tk also elements of the graphic interface can be accessed and changed. With that the representation of values or test outputs is expandable in user specific ways. It is possible to use provided or own graphical objects to create test and control applications. With the help of the multifaceted possibilities for displaying and reporting data test sequences can be carried out automatically and over the network.

port GmbH can perform special adoptions to the GUI or behaviour to meet the CAN or CANopen device characteristics for service or assembly testing.

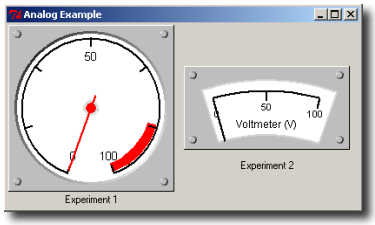


Figure 29, Example Analog

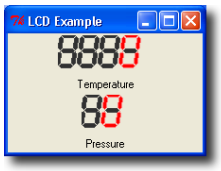


Figure 30, Example LCD

The examples make usage of the User Extension mechanism of *CAN-REport*. Therefore the contents of an example has to be copied to the directory of the executable *CAN-REport* before it can be used.
However, when the file application.tcl of an example is loaded with File→Open the user interface is shown but not updated by incomming CAN messages.

Demo-Mode

In demo mode the console plays a demo script and opens the provided examples.

10.4. CANopen functions

The CANopen-Extension provides some basic functionality for accessing the object directory of a CANopen SDO-Server. Therefore the *CAN-REport* acts like an SDO-Client. The read and write function use Expetited-SDO-Transfer. With Expetited-SDO-

Transfer a maximum of 4 Bytes can be transmitted.

Overview of user function

r {idx sidx dt}	- *read data with expetited SDO transer*
setRemoteID {nid}	- *set remote Id for SDO transfers*
set_sdo_timeout {val}	- *set timeout for SDO-Transfer*
w {idx sidx dt val}	- *write data with expetited SDO transer*

Detailed function description

r {idx sidx dt}

read data with expetited SDO transer

This function is only available with the
CANopen extension.
The node id has to be set previously

Arguments

idx - Index of the server object
sidx - SubIndex of the server object
dt - Datatype of the value

Results

"ERROR ..." - Error, reason is given
value - Success

setRemoteID {nid}

set remote Id for SDO transfers

This function is only available with the CANopen extension.
The initial value is 0x20.

Arguments

nid - new node id

Results

0 - Error
1 - Success

set_sdo_timeout {val}

set timeout for SDO-Transfer

This function is only available with the CANopen extension.
The initial value is 1000 ms.

Arguments

val - new timeout (ms)

Results

w {idx sidx dt val}

write data with expetited SDO transer

This function is only available with the
CANopen extension.
The node id has to be set previously

Arguments

idx - Index of the server object
sidx - SubIndex of the server object
dt - Datatype of the value
val - value itself

Results

"ERROR ..." - Error, reason is given
"OK" - Success

11. Configuration

11.1. Configuration files

The configuration for *CAN-REport* is stored in the files <canreport.rc> and <co_cfg.rc>. These files are read when they are in the working directory of *CAN-REport*. Comments in the file are prepended with the character '#'. The commands in this file set variables that define the appropriate behaviour and option. Most options can be set with menus. However some can only be specified in this file by hand. The following table describes the options that can only be set by hand.

Variablename	Values	Description
ST(showSplash)	0,1	enable/disable Splash screen at start up
ST(txch)	0 - 20	number of tabs for transmitting CAN messages
ST(line1,font-XXX)	font	Font for message xxx
ST(line1,font-XXX,foreground)	color	foreground of font used for message xxx
ST(line1,font-XXX,background)	color	background of font used for message xxx

XXX can have the values: stderr, stdout, usr; stdout is normally used in the main logging window. The CANopen extension specifies further colors for different services. However the values are stored in the file <co_cfg.rc>. XXX can have the additional values: nmtcmd, nmtstate, lssreq, lssresp, pdo, sync, srdo, sdoreq, sdoresp, sdoerr, emcy, flyma.

Changing the background color sets the color for selected text to the exact same color.

11.1.1. Snippet of configuration file

```
set ST(line1,font-stdout) {-*-Courier-Medium-*-*-12-*-*-*-*-*-*-*-*-*}
set ST(line1,font-stdout,foreground) blue
set ST(line1,font-stdout,background)

set ST(line1,font-stderr) "Helvetica 18 bold"
set ST(line1,font-stderr,foreground) #00FF00
set ST(line1,font-stderr,background)
```

11.2. Configuration of serial interfaces

The particular hardware can be selected in the following configuration dialog. *Serial Port* allows the configuration of the serial port (COMx on Windows and /dev/ttySx on Linux respectively) and the CAN baud rate can be configured by *Bitrate*.

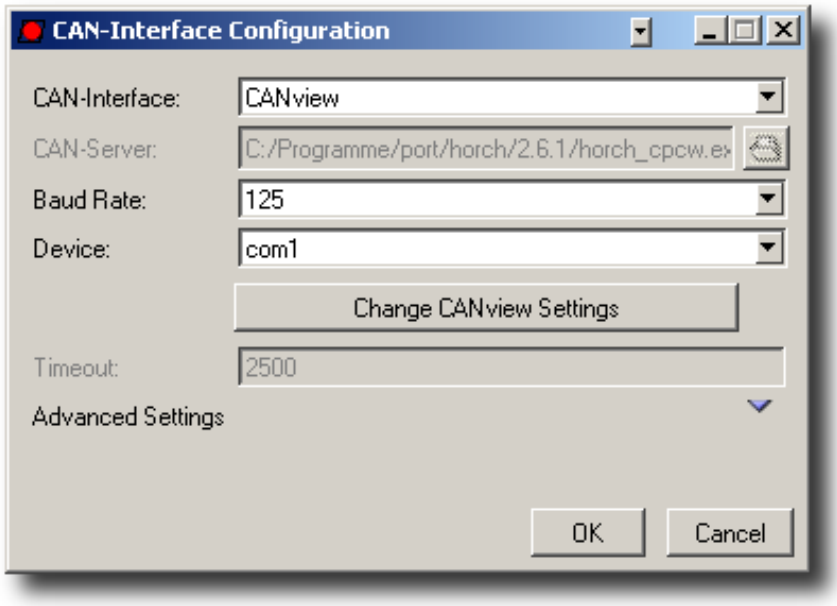


Figure 31, Configuration dialog

11.2.1. CAN232 - Configuration

Please ensure that your CAN232 is connected properly to the power supply and to the PC. After pressing the button *Configure CAN232* the *CAN-REport* tries to connect to the CAN232 by scanning the RS232 baud rates 230400, 115200, 57600, 38400, 19200, 9600, 2400. On success a dialog window is opened to change the RS232 baud rate.

Note: Baudrate scanning does not work under Windows 98. The current used baudrate has to be inserted by hand

11.2.2. CANview - Configuration

After pressing the button *Change CANview Settings* a dialog window is opened to configure the CANview settings.

Please regard that it does **not** configure the device. Instead the *CAN-REport* has to be configured according to the device settings. To change the device settings directly please use the *RM Device Configurator*.

12. System Requirements

CAN-REport is executables on PC's with Microsoft Windows 9X/2000/NT, Macintosh or UNIX/LINUX systems. It can be used on all systems supporting the *Tcl/Tk* programming language.

Operating system:	Windows 9X/NT/2000, LINUX, Mac-OS
Processor:	Pentium and higher
RAM:	32 MByte
hard disk space:	5 MByte

13. Purchase Order Information

0580/10 CAN Analyzer *CAN-REport*
0580/11 CANopen Extension
0580/12 DeviceNet Extension
0580/00 CAN Analyzer *CAN-REport* (Demo Version)
0580/03 CAN Analyzer *CAN-REport* (Evaluation Version)

Supply always occurs with selected hardware. According to agreement a supply without hardware can occur.

Restrictions

The following combinations can be delivered:

Hardware	Win32	LINUX	Mac
AT-CAN-MINI (port GmbH)		x	
Level-X (I+ME)	x		
EtherCAN (port GmbH)	x	x	x
CPC (EMS-Wünsche)	x	x	